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CALIFORNIA'S GREATEST INDUSTRY

CALIFORNIA'S GREATEST INDUSTRY

A REVIEW OF ITS RESOURCES AND PROSPECTS

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Historical Facts

OCTOBER, 1909, marked the semi-centennial of the beginning of the oil industry. The first oil well was drilled by Col. Edwin L. Drake, in Pennsylvania, in 1859. Prior to this time it was known that petroleum existed in this general locality, as the Seneca Indians had collected it from the surface of streams and pools of water, and small quantities of oil were placed on the market for medicinal purposes.

Drake's first well was only 69½ feet deep. It produced from 10 to 12 barrels of oil per day. The oil was of a greenish color and had a gravity of about 40 degrees Baumé. It was burned in the crude state in rude cruses. From this small beginning, in a brief 50 years, has grown up a great business in the United States, and today it is California's chief industry.

The crude oil from Drake's well commanded a price of $20.00 per barrel, and under the stimulus of a high price other wells were drilled and soon there was an overproduction. Prices were then depressed. Cheap oil served to create a demand and to widen the marketing area. The people were eager for a better illuminant than the pine-knot fire or the whale oil lamp.

Samuel M. Kier was the first practical crude oil refiner. By refining, the illuminating qualities of the

crude product were greatly improved. There was a demand for a better way of burning the crude oil and soon thereafter the present form of kerosene lamp was introduced. Though there have been many improvements in lamps since that time, the general principle remains the same.

The first successful well in California was drilled by Thos. Scott in Ventura County in 1866. In the late 70's other successful wells were drilled near Newhall; but it was not until 1882, when Lyman Stewart and W. L. Hardison undertook to develop prospective oil lands near Santa Paula, that the industry was fairly launched. Ventura County was selected as the field of operations by the pioneers in the industry for the reason that the oil was of a superior quality for refining purposes. At this time there was no market for fuel oil.

The first locomotive to burn crude oil was fitted up in the shops of the Union Oil Company of California at Santa Paula, in 1887. The experiment was a success and demonstrated the practicability of burning oil in all kinds of steam plants. This was the beginning of the building up of the FUEL OIL INDUSTRY in this State.

California petroleum now is the fluid which is causing industrialism throughout much of the Western Hemisphere to pulsate. As a fuel our oil is digging the Panama Canal, developing the vast nitrate

beds of Chile, building up the sugar-refining business in the Hawaiian Islands, and serving further ends in Japan, China and parts of Europe. It is feeding furnaces in Alaska and is, in large part, responsible for the rapid development of manufacturing districts and power plants along the Pacific from the Mexican to the Canadian lines.

The question is often asked, "What is the life of an oil well?" To answer this, several things must be taken into consideration, viz., the thickness and saturation of the oil bearing stratum, the gravity of the oil, the gas pressure, the depth of the well, etc. In general, deep wells last longer than shallow ones, and wells yielding "heavy" oil are longer lived than those yielding "light" oil. A few of the first shallow wells drilled at Newhall and at Santa Paula produced oil in commercial quantities for 25 years, several for 20 years and many, drilled 16 to 18 years ago, are still producing. It is believed that some of the deep wells, now being drilled into the massive oil formation so often found in California, will have even a longer productive life.

The oil industry in California has passed through many vicissitudes, but today it is thoroughly established. The production today is nearly ten times what it was ten years ago, and yet the demand has more than kept pace with the increased production, and the marketing conditions were never better.

Palmer Union No. 2 with Camp in Background

CALIFORNIA'S GREATEST INDUSTRY

In 1910, California produced 75,000,000 barrels of oil, worth $37,500,000. This was the largest production in the history of the State, and makes California the leading oil producing State in the Union. Judging from the extent of the proven oil areas, it is probable that at the present rate of consumption there is enough oil to last for a period of fifty years, and it is believed by many that the bringing in of new fields will prolong the productive period to fully one hundred years.

A comparison of the value of the leading products of the State for the year 1909 shows approximately as follows:

Gold	$20,000,000
Lumber	25,000,000
Citrus Fruits	31,000,000
Petroleum	33,000,000

In 1910 the value of the petroleum exceeded that of 1909 and, therefore, it is evident that the production of petroleum is "CALIFORNIA'S GREATEST INDUSTRY."

W. W. ORCUTT,
Consulting Geologist and Engineer.

Fifty-Two Years of Petroleum

ALMOST fifty-two years ago Colonel Drake completed the first well ever drilled for oil, near what is now the prosperous city of Oil City, Pennsylvania. The well was a very shallow one as wells go nowadays. It never produced more than about twenty-five barrels per day. Yet from this small beginning, the industry has so grown that in half a century there have been expended more than one quarter of a billion dollars in drilling expenses alone, for more than three hundred thousand wells put down for oil or gas in various parts of the United States.

The refining industry has kept pace with the production. The open kettle fires, in which the early refiners attempted to produce kerosene oil, have given place to the modern structure costing millions of dollars and employing thousands of skilled workmen, where are manufactured more than three hundred articles useful in the arts, sciences and general manufacturing industries, and used in the preparation of drugs, chemicals, dyes, cosmetics and lubricants.

The sixty small casks of oil shipped to France as an experiment in 1866, have grown to an annual export of more than two billions of gallons, and the amount received for exports alone since that time has

far exceeded the total output of gold in the United States, since Columbus discovered America.

This does not take into account probably twice as much of the refined product used within the United States, nor does it take into consideration any of the oil used for fuel in our own State, grand California, which has now become the foremost producer. Fuel oil is the prime factor in our billion dollar industry.

Until the heavy oil wells were developed in the Los Angeles city field, the fuel oil business was only a dream. It had been thought when Spindletop first came in with its tremendous gushers, that here was a supply of that liquid fuel for which the large consumers had been waiting for many years, but when they were ready to accept the new fuel, the supply had become exhausted. The Texas field was only a temporary one and had not such staying qualities as have since been developed in California.

What the fuel oil business has meant to California, is almost impossible to even estimate in an article of this length. It might be stated in a general way that we are producing about eighty million barrels of oil per year, of which one-fourth is refined or partially so. This leaves for consumption as fuel, in its natural state, sixty million barrels, or the equivalent of about eighteen million tons of coal. Coal is worth in ship-load lots at San Francisco at least $6.00 per

One of
Palmer Union
Storage
Reservoirs

ton. At this rate, eighteen millions of tons of coal would be worth $108,000,000.00. The producer will receive for his sixty million barrels of oil, probably at the outside, $24,000,000.00, leaving a difference of $84,000,000.00 annual saving to the power consumers on the Pacific Coast, an amount greater than the entire production of agriculture, fruit and precious metals, for the same State, for the same period.

It is this question of cheap fuel that has made California so wonderfully prosperous. It is cheap fuel that makes all manufacturing cities prominent and that has given England her proud place among the mercantile nations of the world.

It is cheap fuel that has made possible over five thousand factories in Los Angeles County alone. It is the ability to provide cheap power that has made the entire State, from the Siskiyous on the north to the borderland of our sister republic on the south, one vast hive of industry, and has made the air of California, once calm with the silence of nature and sweet with the odor of flowers and fruit, to vibrate with the hum of millions of wheels whirling to supply the demands of a varied commerce.

It is the question of cheap power that will continue to build up California and the entire Pacific Coast. We are already commencing to raise enormous amounts of cotton, which our cheap power will turn into cloth which will find a ready market, to clothe

the natives of the far East, who are our legitimate customers.

We are already producing oil worth more at the wells, than the entire citrus fruit crop packed in boxes and loaded on cars for shipment; worth more than the combined output of lead, silver, gold and copper; worth more than the product of any one industry now in California. This is only on a fuel oil basis, where, as before stated, at least twenty per cent of the entire amount is refined or partially so, and its value increased anywhere from fifty to two hundred per cent thereby.

In this State alone we have already drilled over six thousand wells, at a cost of probably more than $60,000,000.00. Already there has been spent for field equipment, buildings, tools, machinery and pipe, at least half that much. Uncovered earthen storage capable of holding forty million barrels of oil, has cost approximately seven cents per barrel. Reinforced concrete reservoirs of enormous capacity have called for the investment of other millions, while steel tanks that have cost upward of $7,000,000.00 dot the Pacific Coast from Nome to Valparaiso, and extend along the railroad from tidewater to beyond the Rockies and form great tank farms in the various fields.

More than two thousand miles of pipe line have been constructed from the wells to shipside and re-

fineries. Pumping stations are strung along them wherein the ceaseless throb of the monster pumps never stops, night or day, in the effort to supply a waiting market with our peerless fuel.

Steel steamers ply the waters of the Pacific to supply the fuel consumers of the far off islands, the miners of Alaska, and furnish power for the great dredgers and steam shovels of the Panama Canal, and in these vessels more than $4,000,000.00 are now invested. Nine thousand tank cars, that have cost $12,000.00 each, are constantly employed in transporting the oil to the places where neither pipe line nor ship can reach.

There are more than thirty refineries in the State, ranging from the splendid plants at Point Richmond, Oleum, Port Costa, Gaviota, Redondo, and the new one now being built at El Segundo, to the small ones of a daily capacity of fifty barrels and upwards, each, scattered all through the State. We are producing more than $2,000,000.00 worth of asphalt annually, and this is only one by-product out of hundreds.

In the United States as a whole there are employed an aggregate of more than 49,000 men in the fields whose wages exceed $1,000,000.00 per week. This is a greater number of men than the army of the United States, and in themselves comprise an industrial force that produce more clean wealth than twice that number of men engaged in any other industry;

that produce wealth that is being distributed every day to hundreds of thousands of shareholders scattered broadcast throughout the world.

In Los Angeles alone there is distributed in dividends every month an amount equal to several times more than the dividends paid by nearly half a hundred national banks in the same city, and this does not take into consideration the enormous revenues paid every month to the holders of land, as rents or royalties, which amount is constantly growing and constitutes an important factor among the wealth producing agencies in California.

ALLEN G. NICHOLS,
Editor "Oil Industry."

The Petroleum State

IN OIL, California today leads the world. Long known as "The Golden State," it might well change this title to "The Petroleum State," and none could dispute it. In 1910 its net commercial production was 74,849,700 barrels; add to this oil burned in field development, you have a gross production of about 77,500,000. The nearest approach to these figures was the combined output of Oklahoma and Kansas, amounting to 56,000,000 barrels, net. California produced ten times as much as Pennsylvania, the original home of the world's oil industry.

Russia, alone, that with the United States yields ninety per cent of the entire world's oil supply, has ever reached this California record. It has an output, at present, equal to about twenty-five per cent of that of the United States today. Its maximum gross output in any one year was 80,000,000 barrels. Now it is much less. In 1910 it was 56,000,000 barrels, about the same as that of Oklahoma and Kansas. This year it should be between that figure and 60,000,000, and possibly more on account of opening new fields.

During the first six months of 1911 California yielded 37,379,508 barrels net commercial oil; field fuel,

2,321,832; gross production, 39,841,305 barrels; average daily net production for 181 days, 206,516 barrels; making a total net production for 365 days, supposing the daily average to remain unchanged, of 77,171,532 barrels. On this basis the year's gross production will be 80,342,963, which is practically Russia's maximum gross output.

The commercial shipments from the fields for the first six months of 1911 were 31,321,771 barrels; for the last six months of 1910 they were 30,080,290; increase, 1,241,481 barrels. At this rate 1911's total will be 63,162,788 barrels.

California oil is good for everything obtained from Eastern oil except by-products of paraffine. Besides, it makes the very best asphalt, it is a magnificent dust-layer and road-making material, now used on thoroughly scientific principles, and as fuel it serves every purpose of coal or wood, except for forging and smelting, and the difficulties in these lines are being gradually overcome. It runs the Pacific Coast's locomotives, trolley cars, steamships, lighting and power plants, irrigation pumps, and heats buildings. It has just come into use on the railroads of the Northwest and it seems certain that ere long the United States Navy will use it on a big scale as it is doing in a small way now. Its adaptability for naval use has been demonstrated in Europe. For gas making it is superior, and the natural gas

Famous Palmer Gusher No. 1 with Reservoir

possibilities of the wells are just beginning to be recognized.

The surplus now being accumulated will be the best inducement for consumers to adopt oil as fuel, and to spread its use around the world. The opening of the Panama Canal will double the ocean shipping of the Pacific Coast, and undoubtedly there will be hundreds of oil-burning vessels among those coming here as the movement to oil fuel is not local, but world wide. California oil is building the Panama Canal, is burned on the Panama railroad, and on the railroads of Guatemala, Nicaragua and Chile, and in the latter country's nitrate works.

Practically every field in the State is forging ahead in output. In the great Coast fields of Santa Barbara County, which produced 3,286,659 barrels the first six months of 1911, net production; the Cat Canyon section of the Santa Maria-Lompoc field, first brought in three years ago by the Palmer Oil Company's huge flowing well, Palmer No. 1, the pioneer of this region, has attracted the most attention. Big aggregations of British capital have acquired holdings here in the last six months. One of these is building a standard gauge railroad to connect the Southern Pacific at Batteravia. The Pacific Coast Railroad has extended its narrow gauge line from Sisquoc to the Palmer wells. These railroads will relieve the field of its greatest handicap, viz.: lack of transportation facilities

for material and supplies, and will undoubtedly lead to greatly increased development.

The present over-production affects the middle grades chiefly. One who can produce either an oil above 22 gravity, suitable for refining, or one below 15 that is ideal for asphalt making and for application to country roads, is sure of an excellent market. The Cat Canyon oil is in the latter class, a fact that is fast becoming recognized. Palmer oil used for asphalt making at the refineries at Edna has been an unqualified success, and it is likely that the company will soon build its own plant. The use of California oil asphalt has grown so much that instead of 26,000 tons as in 1901, the output is today close to 250,000 tons, and it forms thousands of miles of city streets all over the United States and Canada, and it is beginning to find a market in the cities of Europe and in South America. California road oil is being shipped as far East as the Mississippi River. In Los Angeles and San Francisco good road oil commands $1 to $1.25 per barrel, which is twenty to forty cents more than for fuel oil.

Palmer oil has been tested as a locomotive fuel by the Southern Pacific and pronounced of superior quality. It is especially commended for its freedom from those properties that clog the boiler flues, thus increasing the steaming capacity and decreasing expenses. It is also very high in heat units.

In three thousand to thirty-five hundred foot territory, where drilling is longer and more costly than in more shallow fields, the Santa Maria-Cat Canyon wells make up for this by their great productivity, long life, and frequently by flowing for long periods. Thus the Palmer's huge well, the Palmer No. 1, flowed practically continuously for nearly three years, yielding 1,993,740 barrels during that period. The Union's Bell wells, on adjoining ground, have made excellent showing, their No. 5 is flowing from 5000 to 6000 barrels per day. In the older part of the Santa Maria field the Union Hartnell No. 1 flowed more than a year and produced 1,500,000 barrels, and has since been yielding regularly on the pump. While these records are the highest there are other wells on the Hobbs, Folsom, Fox and Newlove leases that have surprisingly good records.

During the first six months of 1911 there were approximately 225 wells producing in the Santa Maria-Lompoc region. Others were brought in during that time and produced for various periods, while many were shut in a part of the time, but taking this figure for comparative purposes we find that the average output for six months per well was 14,607.37 barrels; in Kern River, with about 1,650 wells, the average was 3,770.37 barrels; Coalinga, 675 wells, average 13,-100; Maricopa, about 8,500 per well; McKittrick, about 11,000 per well. Of the San Joaquin Valley

fields, Midway alone, where so many gushers are playing their best as the result of abnormally heavy development, exceeded Santa Maria's showing per well. Midway's is about 22,000 barrels per well. Flowing wells and natural gas as fuel enable Santa Maria-Lompoc to get on with 9000 barrels monthly fuel consumption for about 225 wells. Kern River with 1600 wells, a little over seven times as many, consumes 200,000 barrels of crude oil every month as field fuel—about twenty-two times as much. Coalinga, with three times as many wells, burns more than seven times as much oil fuel. It is not hard to see the saving there.

Dr. W. W. Orcutt, the eminent geologist of the Union Oil Company, than whom no man knows the California fields better, compares Santa Maria with the world-famous Russian field at Baku, which he says it more closely resembles than does any other California field. Its proportion of dry holes has been a minimum.

ARTHUR R. HINTON,

"California Oil World."

Palmer Nos. 1 and 2 with Storage Reservoirs

California Leader in the World's Oil Industry, the "Golden State's" Greatest Source of Wealth

IN THE half century since Colonel E. L. Drake sank the oil well at Titusville, Pennsylvania, in 1859, which gave birth to the oil industry of the United States, this country has produced more than two and one-third billion barrels of oil. The rise of the inconceivably huge, established oil industry within the memory of men still active is one of the remarkable economic phenomena afforded in the United States, where vast natural resources have been turned to commercial value through the combined forces of brains, money and organization.

TOTAL ESTIMATED PRODUCTION OF OIL IN UNITED STATES TO DATE WITH TOTAL ESTIMATED VALUES

For the fifty-one years of the history of the oil industry, from 1859 to the close of 1910, the total oil output of the United States reached the estimated aggregate of 2,385,124,000 barrels. More than two billions of dollars was received for the refined oil exported, according to an expert estimate. A single

oil corporation has brought over a billion dollars of foreign gold into the United States. Hundreds of millions of dollars are invested in the development of the oil industry and its subsidiary industries for the refining and transportation of oil. The value of the CRUDE output of the United States from the time the first oil was marketed on a commercial scale to the close of 1910, is estimated in excess of two billion dollars.

Within a half century the production of oil has advanced until today the CRUDE output of the oil fields of the United States is, in value, very greatly in excess of the value of the gold now annually produced in this country.

This statement is readily susceptible of proof. The value of the gold output of the United States for 1910 was $96,055,200. (U. S. Mint estimate.) The oil production of the United States in 1910 was 218,107,795 barrels. The average price of oil at the well for the forty-eight years ending 1907, the country over, and for all grades of oil, was eighty-eight cents per barrel. At this average price the 1910 production was worth $191,934,815, almost double the value of the gold production. While the estimated price, eighty-eight cents, may be and probably IS too high, due to the fact that the price center has been shifting downwards from the place it occupied when Pennsylvania was in the hey-day of its production of light

oils, and must needs follow the different grade of oil produced, this price does not take into account the still greater value of refined oil after the cost of refining is deducted. Thus the real value of the petroleum production is not readily arrived at and can much more easily be underestimated than exaggerated at the figure used.

CALIFORNIA FOREMOST PRODUCING OIL REGION

Of all the oil producing regions of the world, California stands foremost. It produces more than one-fifth of the oil of the world and more than one-third of that of the United States.

According to Bradstreet's the oil companies of California have returned to their stockholders over $60,000,000 in twenty years. In all probability this figure does not take into consideration the profits returned by several of the greatest companies in the State, which do not declare their profits to the public.

The oil production of the world for 1910, carefully estimated (no absolute figures are ascertainable) was 305,926,935 barrels. The United States produced, by this approximate estimate, 218,107,795 barrels, or 64.6 per cent of the oil of the world, and California produced 38.17 per cent of the oil produced in the United States.

The following table displays the great lead which

the United States holds over all the countries in petroleum production. The table shows the production in metric tons instead of barrels, which vary in capacity and weight. The nearest competitor of the United States is Russia, and Russia produced in 1910 less than one-third as much oil as this country.

PETROLEUM PRODUCTION OF THE WORLD IN 1910

Countries	Metric tons
United States	29,585,973
Russia	8,952,793
Dutch East Indies	2,004,000
Galicia	1,491,600
Roumania	1,352,300
India	1,017,000
Mexico	542,400
Other Countries	786,480
Total 1910 production of world in metric tons	45,732,546

SIGNIFICANT PERCENTAGES

The production of the entire United States for 1910 was, as shown in the table, 29,585,973 metric tons of oil, a gain approximating 20 per cent over last year's 1909 production. This wonderful output comprised 64.6 per cent of the world's production, the total in-

View of Palmer Camp with Storage Reservoir in Foreground

crease of which, over the preceding year, was approximately 16 per cent. This leads us to

CALIFORNIA'S MARVELOUS RECORD

California's output last year was absolutely astounding. Not only was our production over 1909 increased by 33 per cent, but this State actually produced 38.17 per cent of the total output of the United States and approximately 22 per cent of the entire world's production. The whole world was called upon to take notice of the wonderful activity in California. The sudden jump in production was occasioned by the desire of producers to take advantage of the high prices prevailing at the beginning of the year, and the striking of the phenomenal gushers of famous Midway, of which the Lakeview was the greatest, being the largest well ever drilled in the United States.

A FEW COMPARISONS

Comparisons which will serve to impress firmly California's premier position in the production of oil are shown by the following:

Russia's output (from Baku and Grosny) approximated not quite 85 per cent of California's. Next as an oil producing region the Dutch East Indies, among foreign countries, produced slightly less than 20 per cent of California's production. Galicia pro-

duced 14 per cent and a fraction as much oil as California. Roumania's production was not quite 13 per cent of that of California. India's output was slightly less than ten per cent of that of the "Golden State"; Mexico, that much heralded oil country, land of the famous Dos Bocas and Portrero del Llano gushers (the greatest in the world), produced, in 1910, little more than 5 per cent of California's production. All the other producing countries in the world combined made an output approximating 7½ per cent of California's.

In number of barrels produced rather than percentages, California's production was approximately 18,000,000 greater than Russia's, and greater than the combined production of the Dutch East Indies, India, Galicia, Roumania, Mexico, China, Canada, Alaska, Germany, The Straits Settlements, Trinidad, Australia and New Zealand, Peru and Columbia. In fact, a glance at the table presented will show that California produced more oil than all the oil fields of the world combined lying outside of the United States, excluding the output of Russia, and exceeded the output of that country by approximately 18,000,000 barrels, as has been already stated.

GROWTH OF THE OIL INDUSTRY

Despite the present magnitude of the oil industry in the United States, as late as 1874 the total annual

oil production of the nation was under eleven million barrels (10,926,945). By 1880 the total production had risen to 26,286,123 barrels, of which Pennsylvania and New York produced 26,027,631 barrels. It was not until 1895 that California, now the greatest oil producing State in the world, exceeded the million-barrel mark with a production of 1,208,428 barrels of oil. The following table will be of interest, showing the growth of the oil producing business in the United States from 1904 to 1910:

CALIFORNIA'S GREATEST INDUSTRY

Production of Crude Petroleum in the United States

(In Barrels of 42 Gallons)

CALIFORNIA LEADS ALL THE STATES IN THE PRODUCTION OF OIL

Field	1904	1905	1906	1907	1908	1909	1910
California	28,476,025	35,671,000	30,538,000	40,085,000	45,000,000	58,250,300	77,697,568
Colorado	501,736	550,000	600,000	400,000	411,836	310,771	350,000
Texas	21,672,111	30,354,263	12,666,000	12,350,000	11,206,464	9,256,000	8,603,862
Louisiana	6,611,419	9,672,015	7,100,000	4,620,000	6,835,130	3,220,000	7,290,396
Illinois	.....	.....	4,900,000	24,540,024	33,685,106	30,898,339	32,984,736
Ohio, Indiana	24,094,849	22,102,108	25,680,000	8,030,000	7,287,000	6,192,000	5,171,000
Kansas, Oklahoma	5,617,527	12,000,000	21,929,905	47,556,906	48,274,782	48,007,267	59,023,333
Kentucky, Tennessee	998,284	1,200,000	1,000,000	1,250,000	1,250,000	639,016	75,000
Pennsylvania	30,410,183	28,324,324	27,345,600	25,500,000	24,240,000	25,384,200	26,089,900
Wyoming	11,542	12,500	13,000	13,000	13,000	22,137	22,000
Others	2,527	3,000	4,000	3,000	3,000	5,000	6,000
Totals	118,396,203	139,889,210	131,776,505	164,347,930	178,206,318	182,185,030	217,313,795

OIL, KING OF FUELS

The great reason for the amazing progress made by the California oil industry is the superiority of oil over coal as fuel, and the fact that there is no coal to speak of on the Pacific Coast to compete with oil, if it can be said to compete with oil anywhere where the products are approximately the same cost for the same heating power.

As late as 1902 the output of oil in California was but 13,984,286 barrels, a then unprecedented total; yet in the brief space of a decade the struggling industry has become a commercial giant. The cheapest fuel the world has known, California oil, now supplies practically all the railways on the Pacific Coast. In 1910 California oil invaded the territory dominated by coal in the Northwest, and was introduced on the Northern Pacific, Great Northern and Canadian Pacific Railway systems. The nitrate factories in Chile, mines in Alaska, railways in Alaska, steamers in Alaska, locomotives in Central America and manufactories in the industrial centers of the Pacific Coast use California oil—not coal. The work on the Panama Canal is consuming California crude oil and the market in South America is rapidly advancing. With the opening of the Canal and the establishment of storage systems at Atlantic and foreign ports, the market will undoubtedly advance to meet the price of coal. Oil is the cheapest and most

easily handled source of power for maritime traffic and its use in the United States Navy and in the merchant marine service in the Pacific is foreordained.

The production of fuel oil in the "Golden State" and the establishment of the existence over a vast area of its proven oil fields, together with the building of comprehensive systems of oil pipe lines, the storage of oil in huge quantities so that large consumers may be assured of a constant supply, and a conversion of coal burning furnaces into oil burners has ushered in a new industrial era in the West.

The increase of storage facilities for California oil is of the utmost importance to induce large consumers to outfit with oil burning furnaces, so that they may adopt oil as a permanent fuel. The close of the year 1910 saw a total storage estimated at 32,000,000 barrels. That storage has now reached almost 40,000,000 barrels. Vast storage projects are under way and the equipment of oil depots in Alaskan ports is but the first step in the establishment of chains of stations in far countries on the Pacific litoral. With the opening of the Panama Canal the consumption of California oil will doubtless be tremendously increased because oil must, sooner or later, supplant coal as fuel on all trans-Atlantic and trans-Pacific liners.

The relative production of the California fields is shown by the following table:

Palmer Gusher
No. 2
and Sump Holes

PETROLEUM PRODUCTION IN CALIFORNIA BY DISTRICTS FOR 1910

District	Barrels
Kern River	14,776,435
McKittrick	5,471,613
Midway	11,174,207
Sunset	9,218,904
Coalinga	18,651,470
Watsonville	36,660
Arroyo Grande	22,310
Lompoc	698,210
Santa Maria	6,909,620
Summerland	74,725
Santa Paula	492,147
Newhall	160,428
Salt Lake	3,263,104
Los Angeles	466,514
Whittier-Coyote	1,198,260
Puente	38,960
Fullerton Brea Cañon	5,044,001
Total	77,697,568

CALIFORNIA'S OIL RECORD FOR FORTY YEARS

The annual output of California oil wells, in barrels, with the value, for each year for a period covering forty years, is shown by the following table. Al-

though oil was produced in 1870, it was not until 1896 that the annual output exceeded 1,000,000 barrels:

Year	Barrels	Value
1870.....	3,600	$5,125
1871.....	5,200	7,370
1872.....	6,500	9,876
1873.....	7,200	10,920
1874.....	7,700	11,540
1875.....	8,400	12,090
1876.....	9,600	15,410
1877.....	12,750	18,140
1878.....	15,227	22,780
1879.....	19,858	29,672
1880.....	42,399	68,450
1881.....	99,862	130,678
1882.....	128,636	172,730
1883.....	142,857	207,540
1884.....	262,000	428,600
1885.....	325,000	613,920
1886.....	377,145	642,785
1887.....	678,572	1,357,144
1888.....	690,333	1,380,666
1889.....	303,220	368,048
1890.....	307,360	384,200
1891.....	323,600	401,264
1892.....	385,049	561,333
1893.....	470.179	608.092

Year	Barrels	Value
1894	783,078	$1,064,521
1895	1,245,339	1,000,235
1896	1,257,789	1,180,793
1897	1,911,569	1,918,269
1898	2,249,088	2,376,420
1899	2,677,875	2,660,793
1900	4,329,950	4,152,928
1901	8,754,500	7,487,600
1902	13,973,500	10,269,385
1903	24,337,828	16,521,400
1904	28,476,025	19,896,702
1905	35,671,000	23,381,150
1906	36,474,000	26,029,155
1907	38,265,200	28,708,750
1908	45,546,500	32,109,620
1909	56,982,670	33,000,000
1910	77,697,568	40,000,000
1911	78,845,082	43,000,000

Valuations are based on selling price at tidewater.

ECONOMY OF FUEL OIL

The economy of oil in comparison with coal has many phases, and as a result of the fine showing of oil it has not only come into general use on the Pacific Coast, but California fuel oil is rapidly coming into commercial use in foreign markets. Practically every

furnace west of the Rocky Mountains is now equipped or soon will be equipped with oil burners—factories, mines, mills, power works, refineries, gas works, smelters—almost every industry that consumes fuel now use oil whenever it is possible to obtain a supply of the liquid fuel. The market for oil is world wide. The Government alone spends millions of dollars for fuel for its warships on the Pacific. As three barrels of oil equal one ton of coal, with coal at $6.00 a ton and fuel oil at, say 60 cents a barrel at the well, the saving of oil over coal from a fuel point of view is tremendous, but this is not all: It costs twice as much to transport coal as it does oil. An oil car carrying fifty-three tons of oil will do the work of one hundred and twenty-five tons of coal; to transport 125 tons of coal will require three large coal cars; it would cost at least $12.00 to unload the coal cars, while the oil cars can be unloaded for $1.00. Oil has no clinkers and no ashes. It is not necessary to draw fires in order to clean the furnaces. Warships can fill up with oil in a rough sea just as they take water, through a pipe. Oil requires no stokers. On vessels not only can the number of men be greatly reduced, but also the number of boilers. Oil requires less space than coal and as a modern steamer is always equipped with ballast tanks, oil may be carried in these tanks.

While the fuel oil market is the mainstay of the California producer, there is nevertheless another

great developing market at the present time. Ten years ago 27,000 tons of ASPHALT was manufactured in California; last year the manufacture of asphalt had increased so that the total amounted to 151,000 tons; and, further than this, the demand was by no means satisfied. The estimated tonnage for 1911 is 240,000 tons. In fact, the demand for California liquid asphalt is only in its infancy. We have it from the highest source that a great syndicate is now being formed in the East to secure property to erect plants and manufacture asphalt on a very large scale. The outlook for road development and building in the United States is the brightest in decades, and a great market for liquid asphalt will doubtless spring into existence when its merits receive the general recognition they deserve from the general public and road constructing engineers. As many millions of dollars are to be expended in roads the country over, it is generally thought that with the recognition of the value of liquid asphalt a market can be developed for it which may, in time, consume all the surplus production California will ever have, although that is by no means the greatest matter to be desired in oil circles in this State.

Perhaps the best refining oil from which to manufacture asphalt, and the oil from which the highest quality of gasoline is extracted at the same time, is that produced in the Palmer extension of the Santa

Maria field. This oil is undoubtedly going to command a greater and more insistent market than heretofore, because of its composition and because of its closeness to deep sea transportation, reducing the cost of getting it to market and thus of purchase by the consumer.

California's fuel exports have been climbing steadily. This past year San Francisco has shipped oil at a rate which has astonished the rest of the country and caused editorials innumerable in Eastern papers. The demand for our fuels continues to increase, although the market to be gained is not now so large as it was, and the proportion of increase will probably not be so large nor so fast from now on until the opening of the Panama Canal.

EXTENT OF MARKETS

The total consumption of California oil for the year 1910 was 66,172,373 barrels. The major part of this huge consumption was used by the railroads of California, but the market extends from Valparaiso on the south, to Alaska on the north, and from east of the Rockies to the Antipodes. Steamship consumption was estimated at 2,500,000 barrels only, but that item is growing and in itself is fairly large and dependable. Besides railroad and steamship consumption there remains the factory, building, asphalt and multitudinous other smaller markets which it is

Palmer Gusher
No. 2

necessary to supply. The greatest part of the State's production has a steady and growing market right at home, and the nearest competitor is too far away to try competition with us.

CONCLUSIONS

The millions upon millions of dollars invested in the oil business in this State, the several thousands of miles of pipe lines, the great refineries already in operation, the refineries being constructed, the present alignment of the "powers that be" in the oil business, all bespeak a stability which, from five to ten years ago, could not have been imagined, as at that time oil was most notoriously a gamble, with the chances strongly in favor of the "big fellow."

It is our belief that, with the continued investment by great and small corporations alike in California oil, a future which cannot possibly be other than stable and tremendously profitable awaits the entire oil industry. When necessity demands, new oil districts will be opened in the "Golden State," for California has scarcely begun to "show" the world.

C. C. WRIGHT,
Editor "Oil Derrick."

Santa Maria Oil Fields Richest in America, Rivaling Famous Baku Field of Russia

THE Santa Maria Oil Field, in a number of important respects, closely resembles the famous Baku District of Russia, heretofore considered without a rival in amount of production and longevity of its wells. In both cases oil is found at a very great depth. In both the thickness of the oil-bearing formation is greater than in any other fields in the world, and in both the dip of strata is very gradual and regular, indicating a blanket formation whose extent in the Santa Maria District is yet undetermined. In the Santa Maria Field the dip of the oil strata is only from three to ten degrees.

One of the most remarkable features of the Santa Maria District is the extraordinary thickness of the oil sands and their high saturation with petroleum. The sand of the Santa Maria Field is somewhat finer and darker than that of the Baku Field, but is identical with that of the latter in the fine crystalline particles that compose it, and the saturation of the sand with oil is estimated to be about 40 per cent more than the usual oil sand saturation. For this reason

the wells in the Santa Maria Field are believed by experts to be almost inexhaustible and will undoubtedly be big producers for many years. Some of the Baku wells have been producing for over one hundred years.

The Santa Maria wells are nearly all very deep, the average ranging from 2500 to 3500 feet, while several are more than 4000 feet. The deepest producing well in the world is in the Santa Maria district and is down 4600 feet. Although this condition renders drilling a slow and expensive process, operators are amply rewarded for their time and money consumed in bringing in a well, for the wells when they do come in are unusually large producers, anything less than a 200 barrel well, which in most fields is exceptional, being regarded as small, while many of the wells average from 500 to 3000 barrels a day.

The tremendous gas pressure is an important aid, as many of the wells come in as gushers and for a long time flow from the top of the casing without pumping, and only after the gas pressure weakens is pumping resorted to, when the wells generally continue with a production of several hundred barrels a day for many years. The Hartnell well No. 1, which was brought in by the Union Oil Company in December, 1904, hurled a continuous stream of oil eight inches in diameter clear over the top of the derrick and was only brought under control after

many hours of hard work. Over 2,000,000 barrels of high grade oil was obtained from that one well in 20 months, and, although its production is much less today, it is still a good well. Near it is located another famous gusher which has yielded between 2500 and 3000 barrels a day. The Palmer well No. 1, in the eastern end of the field, came in with a daily production of 300 barrels, but after pumping at this rate for some months, opening up the veins in the oil sands, commenced flowing at the rate of 6,000 to 10,000 barrels per day. It flowed steadily for nearly two years at the rate of 1500 barrels per day, and has already produced over a million barrels of oil, with every prospect of continuing as a producer for many years because of the great gas pressure.

The Santa Maria Oil Field enjoys several exceptional advantages over other fields, one of which is its proximity to tidewater and a good shipping port. Pipe lines have been constructed which connect with the wells of all the producing companies and extend either to Port Harford, Oilport or Alcatraz Landing, at Gaviota. In each instance the distance is about 30 miles. Oil refineries are located at all three ports, the one at Port Harford being owned by the Union Oil Co. and used in distilling off some of the products while the balance is piped to tank steamers and shipped to its large refinery at Oleum, near San Francisco. At Alcatraz Landing the Associated has a

Palmer Union Gusher
No. 1

large and complete plant. This company separates the distillable products and ships the greater part of the residue, which is an ideal fuel oil, to Japan, the Japanese government having made a contract with companies in the Santa Maria Field for large quantities. The Oilport refinery has recently been completed at a cost of nearly $1,500,000. This refinery is affiliated with the Graciosa Oil Co., whose product it was intended primarily to handle, but three pipe lines pass the grounds and the refinery will doubtless become a large purchaser of crude oil.

Santa Maria oil, which contains an average of only 1½ per cent of water and sediment, is the purest oil known, having an asphalt base, the wells of the Brookshire and several other companies in the immediate vicinity showing less than two-tenths of one per cent slush. Oil from the deeper wells yields a high percentage of distillates, a test made with 28 gravity oil from one of the wells showing that six grades of oil may be obtained, including gasoline and distillate, two grades of kerosene, benzine, naphtha and engine oil, and the residue was an 18 gravity oil which is an ideal fuel oil. By further distillation other valuable products may be obtained and a heavier fuel oil is still left. In the shallow wells and in the eastern portion of the field a high grade fuel oil is obtained, the Palmer well showing up a 16 to 17 gravity oil.

PALMER UNION OIL COMPANY

HISTORY OF THE FIELD

The Santa Maria Field is about ten years old, the first effort to test the territory for oil having been made in 1899. For many years prior to that time the great land owners, whose holdings covered thousands of acres in many instances and were used chiefly for cattle raising, had often noted the peculiar sticky gaseous deposits found in many parts of northern Santa Barbara County, but had given the matter little thought until geologists and men familiar with asphalt and petroleum formations began to take an interest in the surface structure and rock stratifications, and gave it as their opinion that petroleum beds must exist somewhere beneath the surface in that district. In 1902, the production of crude oil in the Santa Maria Field, according to official reports, amounted to 99,283 barrels, and since then it has been increasing by leaps and bounds until during 1910 the production for the year amounted to the total of 6,909,620 barrels.

A remarkable feature of the Santa Maria Field is the unbroken condition of the shale in most localities, and this accounts in a large measure for the light gravity of oil and for the exceptional longevity and productiveness of the wells. When the crusts over the oil sands are pierced, gas escapes in great quantities, carrying oil with it and frequently hurling a stream of petroleum several inches in diameter clear over the top of the derrick and more than 100 feet

in the air. In such cases the well will often flow for many months and sometimes for years, without pumping, and the annual production is enormous.

TEN REASONS WHY THE SANTA MARIA OIL FIELD SHOULD COMMAND THE ATTENTION OF THE INVESTOR IN OIL STOCKS AND SECURITIES

One: The geological and structural conditions are ideal and perfect.

Two: The oil measures are massive, being from 300 feet to 500 feet in thickness. They are thoroughly saturated with oil and the gas pressure is heavy.

Three: The oil horizons are found at a depth below the surface from 2000 to 3500 feet. Thus depth of wells, heavy gas pressure, massive oil horizons and ideal geological and structural conditions all tend to make long lived, big producers of high grade fuel and refining oils.

Four: The cost of drilling is low as compared to the cost of drilling to the same depth in other fields.

Five: Many of the wells of the Santa Maria Field are "gushers," and nearly all flow more or less, thus reducing the cost of raising the oil to the surface to a minimum.

Six: Proximity of the Santa Maria Field to tidewater.

Seven: There are three eight-inch pipe lines and one six-inch pipe line leading from the field to tide-water, which gives it the best pipe line facilities of any field in the State.

Eight: The "staying" qualities of the wells have been demonstrated by seven years' continuous production, and these wells are still producing heavily.

Nine: The average production per well is over two times as great as the average production per well in any other field in the State.

Ten: The acreage of the Santa Maria Field is held very closely by a few legitimate companies who are producing oil as an industry. All of these companies are successful and paying large dividends.

Considering the above facts it is evident that the conditions are very favorable for the investor in oil stocks and securities.

W. W. ORCUTT,
Consulting Geologist and Engineer.

Properties of the Palmer Union Oil Company

PRODUCING oil lands of this corporation are as follows:

All those certain tracts or parcels of land situate in the County of Santa Barbara, State of California, and more particularly described as follows, to-wit: The west half (W. ½) of the southwest quarter (S.W. ¼) of Section Seven (7), in Township 9 North, Range 32 West, San Bernardino Meridian, and the south half (S. ½) of the northeast quarter (N.E. ¼) and the southeast quarter (S.E. ¼) of Section Twelve (12) excepting a square parcel of land in the southeast corner of the same, containing ten (10) acres, and all of Section Thirteen (13) in Township 9 North, Range 33 West, San Bernardino Meridian, containing in all nine hundred and fifty (950) acres, or thereabouts.

All of Section Twenty-four (24), and the east three-quarters (E. ¾) of Section Twenty-three (23), in Township 9 North, Range 33 West, S. B. B. & M., containing eight hundred and eighty (880) acres, or thereabouts.

The southwest quarter (S.W. ¼) and the west half (W. ½) of the southeast quarter (S.E. ¼) of Section

Twenty-nine (29), and the east half (E. ½) of the southeast quarter (S.E. ¼) and the south half (S. ½) of the northeast quarter (N.E. ¼) of Section Thirty (30), all in Township 9 North, Range 32 West, S. B. M., containing four hundred (400) acres, or thereabouts.

The north half (N. ½) of Section Twenty-nine (29), Township 9 North of Range 32 West, S. B. M., containing three hundred and twenty (320) acres or thereabouts.

The northeast quarter (N.E. ¼) of Section Twenty-six (26), Township 9 North, Range 33 West, S. B. M., containing one hundred and sixty (160) acres, or thereabouts.

ALSO, all those certain tracts or parcels of land situate in the County of Ventura, State of California, and more particularly described as follows, to-wit:

The northwest quarter (N.W. ¼) of Section Twenty-two (22), Township 4 North, Range 21 West, S. B. M., containing one hundred and sixty (160) acres, or thereabouts; also, the easterly four hundred (400) acres of that certain parcel of land containing eight hundred (800) acres, more or less, and hereinafter referred to as "800 acre tract," and being hereinafter more particularly described; said easterly 400 acres of said 800 acre tract being the easterly 400 acres lying between the easterly line of said 800 acre tract and a line running north and south

LEGEND:-
WELLS
OIL
DRILLING
ABANDONED
OIL PIPE LINES
WAGON ROADS
RAILROADS
SUMMIT
OIL CO.
GARY

SANTA ANA
TUCSON
STANDARD TIME
33

through said tract and parallel to said easterly line; said 800 tract above referred to being particularly described as follows:

Being part of that certain subdivision designated and delineated as "Tapo" upon that certain map, entitled "Map of the lands of Rancho Simi, in Ventura and Los Angeles Counties, California," and recorded in the office of the County Recorder of Ventura County, in book 3 of Miscellaneous Records (Maps), at page 7, and particularly described as follows:

Beginning at 2x4x42-in. redwood post, set on west face of steep mountain side, for the northeast corner of Rancho Tapo; said point being at corner common of Sections 7 and 18, of T. 3, N. R. 17 W. and Sections 12 and 13 of T. 3, N. R. 18 W., Rancho Simi, and from which point a white oak tree, 16 inches in diameter, marked "T. B. T.", on side hill, on west side of cañon, bears south 76 deg., 15 min. west 7.07 chains distant, thence from said point of beginning south 70.00 chains, along range line between T. 3, N. R. 17 W. and T. 3, N. R. 18 west, Rancho Simi, to a point; thence north 73 deg., 18 min., west 208.80 chains to a point; thence north 10.00 chains to a point in north line of Rancho Tapo, and in south line of subdivision "N" of Rancho Simi; thence along same east 200.00 chains to the point of beginning, and containing 800.00 acres.

ALSO, all those certain tracts or parcels of land situate in the County of Kern, State of California, and more particularly described as follows, to-wit:

The southeast quarter (S.E. 1/4) of the southwest quarter (S.W. 1/4) of Section Twenty-three (23) in Township 32 South, Range 23 East, M. D. M., containing forty (40) acres, or thereabouts.

PALMER UNION OIL COMPANY

Extracts from

Report on the Property of Palmer Oil Company, In the Santa Maria District, California

By Ralph Arnold

(Formerly United States Government Geologist)

THE property of the Palmer Oil Company consists of two tracts of land in what is known as the Cat Canyon Field, about twelve miles southeast of Santa Maria, Santa Barbara County, California. The holdings comprise the N. E. 1/4 of Section 26, T. 9 N., R. 33 W., S. B. B. & M., known as the Blochman lease, and about 720 acres in Sections 29 and 30, T. 9 N., R. 32 W., about two miles to the east, known as the Stendel lease. The Blochman lease lies on the northeast flank of Gato Ridge at the mouth of Cat Canyon, while the Stendel properties lie largely on top of the ridge northeast of the canyon.

The geological formations involved in the productive territory of the Santa Maria District consist of the Vaqueros or lower Miocene sandstones, the Monterey or lower middle Miocene shales, and the Fernando sands and gravels of Miocene, Pliocene and possibly Pleistocene age.

The Vaqueros or lower Miocene consists entirely

of sandstone and conglomerate of unknown thickness, but probably many hundreds of feet through. It contains no indications of petroleum except possibly at its very top, where it comes in contact with the overlying Monterey shales. The Vaqueros is believed to underlie the Monterey over much of the Santa Maria District.

The Monterey formation is the most important one, as regards the oil, for it not only contains the strata which act as the reservoir for the oil, but the diatomaceous beds of which it is largely composed are believed to be the source of most of the petroleum in the district. The Monterey doubtless covers as one continuous sheet the whole basin between the Santa Ynez and San Rafael Mountains, and within this area it is unusually constant in composition. The formation is about a mile thick, and consists of two divisions, an upper and a lower, each about 2600 feet in thickness. The lower portion consists largely of shale, sometimes soft, but usually hard and ofttimes flinty. Interbedded with the shale toward the base of the formation are sandstones of varying thickness and composition, and it is in these sands that the productive wells of the district largely derive their oil. I say largely, for in certain instances it seems probable that small interstices in locally fractured portions of the flinty shale may also act as a reservoir for the petroleum. Petroliferous beds occur at one

place or another through 1500 to 2000 feet of the basal Monterey. Two zones are recognizable in this great thickness. The lower one, which varies from 200 to 600 feet through, is the productive zone for both the Santa Maria or Orcutt field proper and the Cat Canyon Field; the upper one, usually from 600 to 1000 feet above the lower, has so far been proven productive only on the south side of Graciosa Ridge in the Western Union wells. It is my belief, however, that much of the Cat Canyon territory, especially that toward the northeastern end of the field, would furnish productive wells in this upper zone. This possibility might be borne in mind in drawing conclusions concerning the value of property in the Cat Canyon region. The upper part of the Monterey consists largely of soft, diatomaceous beds, which, so far as known, contain no commercial deposits of oil.

The Fernando formation is 3000 feet or more in thickness and consists largely of sands and gravels, usually soft and incoherent, and some clays. It contains no oil deposits in this field and is useful only in showing the strike and dip of the oil-bearing beds in places where it covers the Monterey.

So far as known, only two lines of structure affect the formations in that part of the Cat Canyon Field in which the Palmer property is located. These are the Gato Ridge Anticline, whose axis is practically coincident with the crest line of Gato Ridge, and a

somewhat similar fold parallel with and from two to three miles northeast of the Gato Ridge Anticline. The dips on the flanks of both these folds, as indicated by surface outcrops, are low, amounting only to about 5 degrees. Both anticlines plunge toward the northwest, and for this reason one has to go deeper and deeper to attain the same stratum as he goes northwest along the axes of the folds. The structural conditions for the accumulation of oil in both anticlines are practically ideal, owing to the low dips and the regularity of dip along their flanks.

Over fifteen wells have been or are being drilled in the Cat Canyon Field, and although but three of these are on property belonging to the Palmer Oil Company, they all throw more or less light on the underground conditions of the Palmer holdings. The most important of these wells is the Palmer No. 1, located in the southwest corner of the Blochman lease. This well was drilled to a depth of 3200 feet, passing through a thickness of 1500 feet of strata which were more or less petroliferous. The upper part of the petroliferous zone contained no sands that were tested, the lower 600 feet alone furnishing the production. Of this 600 feet about one-third only was thoroughly saturated. Other wells in the immediate vicinity show a greater thickness of saturated sands, but it must be borne in mind that the records or logs of the wells upon which all of these figures are based

are often quite variable, owing to the personal equation of the drillers making the log. It is enough to know that in the lower 600 feet of the Monterey formation in the region of the Palmer well there are from 175 to over 300 feet of saturated sand of such composition as to be an ideal reservoir for the accumulation of oil. It is also important to note that throughout the same region the structural conditions are ideal for the accumulation of oil and are uniform over considerable areas. Furthermore, there is an upper horizon of oil-bearing beds throughout the Cat Canyon region which has not as yet been thoroughly tested, but which it is believed will yield commercial quantities of oil in restricted areas at least.

The Stendel well and wells adjacent to it show that practically the conditions outlined as belonging to the Palmer lease extend under all of the Stendel lease, with the exception that the oil appears to get a little heavier as one goes east through the Cat Canyon Field. Offsetting this are the better indications of productivity in the upper part of the petroliferous zone.

Palmer Well No. 1 has been producing for the last two years, its yield varying from 150 barrels per day at the start, through a phenomenal period of gushing during which it spouted at the rate of 10,000 barrels per day on several occasions, to the present steady flow of about 1400 to 1500 barrels per day. The oil is

View of Palmer Union Oil Company's Property and Storage Reservoirs

of 16 degrees Baumé gravity, having increased some two degrees in quality since the first production was obtained. A heavy and steady gas pressure causes the flow, and, as has been proven by drilling, this same pressure is present throughout the whole extent of the field. Other wells have flowed as much as 600 barrels per day, but these are comparatively new and have not attained what I believe will be their normal yield.

Owing to the unique conditions in the Santa Maria District in general, and in the Orcutt and Cat Canyon fields in particular, comparisons between these two fields are exceptionally fitting. In fact, the conditions in the two fields are so similar and both so different from those of any other of the large fields of the State, that I will confine my comparisons to the two. In the Orcutt Field, individual wells only four or five years old have yielded over 2,000,000 barrels of oil and are still producing from 250 to 800 barrels per day. The average production for the entire Orcutt Field at the time of the preparation of Mr. Robert Anderson's and my report on this district in 1906 (Bulletin U. S. Geological Survey, No. 322), was between 300 and 400 barrels per day per well. The Palmer well itself produced 637,759 barrels of oil up to January 1, 1910, or an average for the entire two years of its life of approximately 870 barrels per day.

It is therefore safe to assume that the wells on the Palmer property will average 200 barrels per day and that they will continue this yield for at least five years; but, to be on the safe side, assume that they will average only 100 barrels per day. Under this assumption it is certain that an allowance of 15 years for their life will be all too small.

The two leases of the Palmer Oil Company comprise together 880 acres. Placing the wells about 600 feet apart—a very conservative distance in this kind of territory—will allow 88 wells for the property. Three of these are already drilled. Assuming the cost of each well as $40,000 and price of oil at 50 cents per barrel net (it is certainly worth more and will, I believe, go much higher), we get the following figures:

Value of 880 acres of land (as per balance sheet Sept. 30, 1909)	$ 2,080,000
Improvements (same statement)	293,000
Cost of 85 wells at $40,000	3,400,000
Value fully developed property	$ 5,773,000
Production 88 wells, 100 barrels per day for 15 years (barrels)	48,180,000
Gross income 15 years, 48,180,000 barrels at 50 cents	24,090,000
Deduct cost of property and development	5,773,000
Gross profit for stockholders from which interest, depreciation and expenses of administration and operation must be deducted	$18,317,000

PALMER UNION OIL COMPANY

I believe that the property of the Palmer Oil Company is underlain by oil strata within such distance of the surface and containing such quantities of oil as will yield an average of at least 100 barrels per day per well for 15 years, and that the 880 acres of the Company is capable of supporting one well on every 10 acres.

RALPH ARNOLD,
Consulting Geologist and Engineer.

Los Angeles, Cal., Jan. 11, 1910.

Extracts from

Geological Report on the Property of Palmer Oil Company, Santa Maria Oil Fields, California

By W. W. Orcutt

LOCATION: This property is located fourteen miles southeast of the town of Santa Maria. It is reached by the Pacific Coast Railway from the new oil town of Sisquoc, three miles distant from the tract.

Climate: The climate is healthful the year round. The summers are cool. The winters are mild and pleasant, without snow and only an occasional frost. The average annual rainfall is sixteen inches. It is precipitated during the months of November to April inclusive.

Topography: The surface of this property consists of mesa land and low rolling hills, suitable for agriculture and grazing. There are several exposures of the country rock on or adjacent to this property.

GEOLOGY

Formations: The formations involved in the geology of this property are, vertically descending, Recent, Pliocene and Miocene.

The Recent formations consist of soft silts and

sands deposited in the valleys. These range in thickness from 5 feet to 100 feet.

The Pliocene outcrops on the higher parts of the property. It consists of soft, light-colored sandstones and soft, crisp shales ranging in color through blue, gray, black and brown. This formation is from 2500 to 3000 feet thick. At the base of this formation occurs the oil sands, interbedded with impervious shales and clays, in what is locally known as the Fernando (Lower Pliocene or Upper Miocene).

Below the Fernando occurs a Miocene formation, consisting almost entirely of soft, light colored shales, locally known as Monterey, which are about 3000 feet thick, as shown in the outcrops of that general locality. These shales underlie all the property of this Company. They are silicious in character and are made up of the microscopic remains of marine, animal and vegetable life. It is believed that the source of the petroleum in this vicinity is from the decomposition of these organisms. These shales are not well adapted for retaining this oil, so it has migrated upward until it came in contact with the porous sandstones of the Fernando above, where it was absorbed and where it and the gas it has generated is now held under a tremendous tension, approximately 600 pounds per square inch.

Structure: This property lies on the northeasterly limb of the Gato Ridge Anticline. Its longitudinal

axis runs northwesterly and southeasterly (see map). It plunges slightly toward the northwest and disappears under the floor of the Santa Maria Valley, about three miles west of this property. It rises toward the southeast and at a distance of three miles from the property exposes along its axis the middle portions of the Miocene shales, which are here stained with petroleum and show thin layers of asphaltum in the seams. The dip of the northeasterly limb of the anticline is slight, about 16 feet to the 100. This dip flattens gradually with distance, so that at two miles from the axis the dip is very low, or the strata are practically flat.

Oil Horizon: Development on this tract of the Palmer Oil Company and on adjacent properties shows that from the top of the first oil sand to the bottom of the lowest stratum yet uncovered is about 1400 feet. Of this oil horizon more than 200 feet is oil sand, made up of several strata, ranging in thickness from 10 feet to 100 feet, separated by strata of blue shale and brown shale, ranging in thickness from 10 feet to 100 feet. Some of this brown shale carries oil and gas. The logs of some of these wells show that there are five distinct oil sands included within this horizon.

Oil Sands: These are composed of coarse sharp quartz and granite particles, in regular strata, but loose and uncemented. It is so soft that much loose

Palmer Union Oil Company's Four 55,000-Barrel Steel Storage Tanks, with 250,000-Barrel Earthen Reservoir in Foreground

sand is discharged with the oil from the flowing wells. The oil from the wells of the Palmer Oil Company is an excellent fuel, with a gravity of 14 to 16 degrees Baumé. Three and a half barrels of this oil is equal to one ton of best Pacific Coast coal.

Development: Palmer No. 1 was brought in about three years ago. Its initial production was small, but it kept improving until its maximum production for several days was approximately 10,000 barrels per diem. Two years ago this well settled down to a production of approximately 1500 barrels per day, which has been maintained to this date.

Palmer No. 2 was also a "gusher," reaching a daily production of 8000 barrels, when, for lack of storage, it was put under control and "shut in." After being shut in for several months, while additional reservoirs and storage tanks were being built, the well was again opened up and thereupon began flowing. This flow has been increasing steadily and today the well is "gushing" approximately 8500 barrels of oil per diem.

Palmer No. 3: This well is on the pump and is producing 300 barrels per day.

Palmer No. 4: This well is also on the pump. It has "sanded up" several times, but as soon as the loose sand is entirely removed from the well, no doubt it will flow also. It has made several short flows. I predict that it, too, will be in the "gusher" class.

PALMER UNION OIL COMPANY

Conclusions: The geological conditions are favorable and the structural conditions are ideal for the occurrence of petroleum in large quantities on all of this particular tract of the Palmer Oil Company. It has already proved itself to be one of the most prolific properties in the State. The wells already developed are unexcelled in productiveness and staying qualities. Taking the results already obtained as a basis for the ultimate production, let us suppose the average thickness of the oil sands on this parcel to be 175 feet and the average saturation 15 per cent, this would give us upwards of 200,000 barrels per acre, or an approximate total of 32,000,000 barrels of oil on the 160 acres. The results already obtained seem to justify these figures.

Estimated Profits: Suppose it costs 10 cents per barrel to drill the wells and raise the oil to the surface of the ground, and that the product can be sold for 50 cents per barrel, this would make a profit from this tract alone of $12,000,000.

The Union Oil Company of California, the Associated Oil Company and the Dome Oil Company all have producing properties adjoining this tract.

I believe that every acre of this tract of land will be productive, and that on the average a higher price than 50 cents per barrel will be realized.

In addition to the above, the Palmer Oil Company owns:

Seven hundred twenty (720) acres located in Sections 29 and 30, in Township 9 North, Range 32 West, S. B. B. & M., lying about two miles east of the above land. Here the geological and structural conditions are also good, and beyond a question commercial oil occurs on this tract in quantity.

On this property one well has been drilled. It penetrated an oil horizon similar to that uncovered in Palmer Nos. 1, 2, 3 and 4, but a greater amount of oil sand was shown to be present in the former than in the latter wells. While physical difficulties have been met with in drilling this well, and in shutting off the water, which have caused considerable delay in completing it, yet these difficulties are not unsurmountable.

On the property adjacent to this on the south, commercial oil has been developed, which has proven a large portion of this tract.

The oil produced here is from 11 to 13 degrees Baumé and is good fuel, but is especially valuable for the manufacture of asphaltum. This product should be made on the ground or at Port Harford, a distance from the field of 38 miles, where there is tidewater and the markets of the Western States and Europe could be reached from it through the Panama Canal, and the markets of China and Japan could be reached on the open Pacific Ocean.

The results of adjoining properties justify the be-

lief that this tract will produce much revenue, and it is probably as valuable as the first tract, if not more so. Its large area gives it tremendous possibilities.

Management: The field force of the Palmer Oil Company is clean, capable and energetic. Its field equipment is plentiful and of the best quality. Its field work is administered in a thorough and workmanlike manner, and in every respect in accordance with the best usages in vogue in the business.

Respectfully submitted,

(Signed) W. W. ORCUTT,
Consulting Geologist and Engineer.

Los Angeles, California,
March 14, 1911.

Geological Report on the Property of the Palmer Union Oil Company in the Santa Maria Oil District, Santa Barbara Co., California

By W. W. Orcutt,
Consulting Engineer and Geologist

DESCRIPTION: The property of the Palmer Union Oil Company consists of the easterly 240 acres of Section 23, all of Section 24, all of Section 13, the west half of the southwest quarter of Section 7, the south half of the northeast quarter, and the southeast quarter, except 10 acres in the southeast corner thereof, of Section 12, all in Township 9 North, Range 33 West, S. B. B. & M., comprising approximately 1730 acres.

Location: The property is located about thirteen miles southeast of the town of Santa Maria, and adjoins the town of Sisquoc, the terminus of the new branch of the Pacific Coast Railway. It adjoins the property of the famous PALMER OIL COMPANY.

Topography: The property consists of rolling hills and mesa lands furrowed with several deep gulches, which give excellent opportunities for examining the geological structure and formation. A

Palmer Gusher
No. 1

considerable portion of this property is suitable for agriculture and the balance for grazing.

Structure: This property lies on the northerly dip of what is known as the "Gato Ridge Anticline." The formations dip northeasterly at an angle of about five degrees, as indicated by the exposures on the ground. The development on the Palmer Oil Company's property tends to show that this angle of dip is maintained in the oil-bearing horizon at a depth of twenty-five hundred to three thousand feet. On the northeasterly corner of the property is a well-defined minor fold about four miles long, the longitudinal axis of which runs nearly parallel with the main Gato Ridge Anticline. The southwesterly limb of this anticline is short and dips at about six degrees to the southwest, finally flattening and forming a small synclinal fold with the northeasterly limb of the Gato Ridge Anticline. The northeasterly limb dips at an angle of about five degrees and disappears under the floor of the Santa Maria Valley.

Geology: The formations which outcrop in the exposures on the property, and those which have been uncovered by drilling wells on adjoining properties, are as follows:

Quaternary deposits of sand and silt, then Pliocene shales and sandstones, at the base of which lies the Fernando, which contains the oil sands at a depth of about 2900 feet. These oil sands, as shown by wells

drilled on the adjoining property of the Palmer Oil Company, have a thickness ranging from one hundred and fifty to three hundred feet, and are thoroughly saturated. The five wells of the Palmer Oil Company which have so far been completed on that property, are all gushers, which have already shown their ability to produce oil in quantities ranging from 500 to 8000 barrels per day respectively.

Evidences of Oil: The Palmer Oil Company, which adjoins the Palmer Union on the south, clearly proves that the southwesterly portion of this property will certainly be oil producing. The West Oil Company, the Henderson Oil Company, and the Brooks Oil Company have all shown oil on the southeasterly end of the minor fold above referred to. There is an asphalt deposit on this anticline outcropping at Fugler's Point, two miles northwest of this property, on the Santa Maria River. The Pinal Oil Company, on the east of and adjoining Palmer Union property, has also uncovered oil sand in its well at 2120 feet, and it is almost certain that this oil horizon will underlie this tract.

Development: The Palmer Union Oil Company are now drilling three wells, two of which have struck the first oil sand, showing that the formations underneath the Palmer Union property are all regular and correspond very closely with the formations encountered in the wells of the Palmer Oil Company.

Conclusions: I believe that the wells now drilling on the Palmer Union property will be completed as good oil wells at a depth of approximately 3300 feet, and it is my opinion that a very large area of the Company's property will be oil producing and equal in every respect to the property of the Palmer Oil Company.

Respectfully submitted
By W. W. ORCUTT,
Consulting Engineer and Geologist.

MR. FRANK L. BROWN,
President, Palmer Oil Company,
San Francisco, California.

Dear Sir: I take pleasure in submitting you the following report upon the physical conditions and development of the Palmer Oil Company's property in the Santa Maria Oil Field, Santa Barbara County, California, as of September 15, 1911:

PRODUCTION

The volume of output of your wells for the past fiscal year has been very satisfactory, in fact so large that the existing storage facilities were inadequate to take care of the tremendous production. Additional storage facilities have been constructed as rapidly as possible, and, in addition to the oil which you have delivered under your sales contracts, you were able to accumulate a surplus of about 750,000

barrels. When all of the available steel tankage and earthen reservoirs were filled, it became necessary to shut in your flowing wells, and about the 1st of June last, Well No. 2, which was then making approximately 7000 barrels per day, was shut in, and shortly afterwards Well No. 1, which had been flowing vigorously for two years, sanded up, and was permitted to lie dormant.

Palmer Well No. 1: Recently it was decided to remove the sand from this well, but before this could be done it was necessary to fish out some broken tubing which had been in the hole for many months. A portion of this tubing was fished out, but 240 feet of 2½-inch is still in the well. The sand was removed down to 2300 feet, when the well began to flow and the work had to be discontinued. There is still several hundred feet of sand in the bottom of the hole. This well has been flowing steadily since it was cleaned out, and is now making about 700 barrels per day. As soon as the well can be cleaned to the bottom, undoubtedly it will resume making as much oil as it did formerly.

Palmer Well No. 2: Has been perforated and just put on the pump with a view of bringing it into production again. It is now doing about 200 barrels per day and the flow increasing gradually.

Palmer Well No. 3: Is flowing, making 250 barrels per day.

Palmer Gusher
No. 2
and Reservoirs

Palmer Well No. 4: This well has just been brought into production, and is now flowing 600 barrels per day and getting stronger.

Palmer Well No. 5: Is completed. It has 185 feet of productive oil sand. Pumping has just begun on this well and it is making a very satisfactory showing.

Palmer Well No. 6: Is 1670 feet deep in the 8¼-inch casing. This well was shut down so that the crew from this well could clean out Well No. 1. Drilling has now been resumed.

Palmer Well No. 7: This well is shut down.

Palmer Well No. 8: This well is drilling at 1050 feet in 10-inch pipe. The formation is blue shale.

Storage: You now have on the Palmer property four 55,000-barrel steel storage tanks and five 10,000-barrel steel storage tanks and earthen reservoirs to be used in emergencies, having a capacity of approximately 1,000,000 barrels. There are approximately 500,000 barrels of oil now stored in these containers.

Improvements: During the fiscal year many improvements have been made on the property which very materially facilitate the work. A new boiler plant, consisting of a battery of five 70-H.P. boilers, has been installed, from which central plant steam is distributed to the various parts of the property for power. Two water wells have been drilled and compressor installed, and your property is now furnished

with water for steam and domestic purposes from your own wells at a very low cost. Additional bunk houses have been built and enlargements of the boarding houses have been made to take care of the growing demands of the work. The old barn has been removed and a commodious one built in a very advantageous position, more remote from the boarding houses, where there is very little fire hazard.

The property is in an excellent condition. The development of your property and the production of oil therefrom is carried on in a thorough and business-like manner.

Respectfully submitted,

(Signed) W. W. ORCUTT,
Consulting Geologist and Engineer.

Sept. 15, 1911.

Palmer Gusher
No. 2
Mirrored in
Reservoir of Oil

$67,550,403 in Dividends Paid by Various Oil Companies in California Compiled from Records in the Office of the Oil Bradstreet

A GRAND total of $67,550,403 in dividends stands to the credit of the oil-producing companies of California.

Below are given dividend statistics on the California oil industry, available through the courtesy of the Los Angeles Stock Exchange. They show the number of dividends to date, or as nearly to date as practicable, the total amount for each company and the impressive grand total of disbursements for the entire oil industry of the State. The trading in oil securities on the floor of the Los Angeles Stock Exchange alone amounts to over $7,000,000 annually.

In view of the current market price of oil stocks and the prevailing rate of dividend disbursements, it may be safely said that no other issues listed on any exchange in the United States yield anywhere near the same rate of profits to stockholders.

California oil stocks also hold the record for paying the greatest aggregate of dividends in a given period of operations.

PALMER UNION OIL COMPANY

Adeline Oil Co.	$ 93,000
Aladin Oil Co.	5,500
Alma Jr. Oil Co.	2,921
Alma Oil Co.	216,600
Amalgated Oil Co.	1,650,000
Amazon Oil Co.	161,491
American Crude Oil Co.	30,105
American Petroleum Co.	2,018,607
Apollo Oil Co.	4,000
Associated Oil Co.	1,522,309
Baby King Oil Co.	7,996
Bakersfield-Fresno	80,000
Bald Eagle Jr. Oil Co.	1,653
Bay City Oil Co.	195,000
Bear Creek	6,839
Drea Cañon Oil Co.	1,068,000
Brookshire Oil Co.	442,500
California Oil Fields, Ltd.	460,000
Canadian Pacific Oil Co.	100,000
Caribou Oil Co.	962,816
Central Oil Co.	923,724
Chicago Crude Oil Co.	15,000
Claremont Oil Co.	502,500
Coalinga Pacific Oil Co.	107,250
Coalinga Western Oil Co.	5,505
Columbia Oil Producing Co.	469,653
Columbian Oil Co.	3,850
Consumers Oil Co.	1,400
Continental Oil Co.	41,295
Del Rey Oil Co.	35,347
Densmore Stavler Oil Co.	27,000
Dome Oil Co.	213,308
Duquesne Oil Co.	50,000
Eaglet Oil Co.	1,800
East Puente Oil Co.	335,000
Eclipse Oil Co.	800
Empire Oil Co.	16,000
Ensign Baker Oil Co.	1,287
Equitable Petroleum Co.	100,000
Esperanza	49,450
Euclid Oil Co.	143,250
Four Oil Co.	213,000
Fresno-San Francisco Oil Co.	4,500
Fullerton-Consolidated	100,000
Fullerton Oil Co.	651,600
Globe Oil Co.	$ 93,000
Golden West Oil Co.	1,800
Golden West (Arizona)	2,500
Good Luck Oil Co.	25,000
Gypsy Oil Co.	40,000
Hale-McLeod	15,000
Home Oil Co.	508,000
Home (Whittier)	68,500
Homestake	84,250
Huasteca Pet.	1,325,015
Illinois Crude	90,498
Imperial Oil Co.	4,000,000
I X L Midway	15,000
Junction Oil	20,000
Kern Cañon Oil Co.	958
Kern Oil Co.	42,000
Kern River Oil Co.	120,000
King Rfng. Co.	6,200
Knob Hill Oil	296,250
Lake Shore Oil Co.	4,500
Linda Vista Oil	92,124
London Petrol Co.	21,935
Lucile Oil Co.	42,727
Mammoth Oil	92,000
Maricopa Queen	28,506
Mascot Oil	219,000
Mecca Oil Co.	71,825
Mexican Petroleum Co.	3,411,806
Mexican Petrol, Ltd.	4,105,199
Midway Five Oil	12,800
Monte Cristo	1,190,000
Mountain Girl	7,000
Mt. Diablo	191,688
M. & S. Oil Co.	73,000
Nevada County	40,000
New Pennsylvania Pet.	55,000
Ojai Oil Co.	12,642
Olig Crude Oil Co.	55,000
Olinda Land Co.	100,000
Palmer Oil Co.	575,780
Paraffine Oil Co.	78,000
Peerless Oil Co.	825,000
Perseus Oil Co.	32,430
Piedmont Oil Co.	26,927
Pinal Oil Co.	991,835
Pittsburg Oil Co.	124,800
Potomac Oil Co.	26,831
Premier Oil Co.	40,000

Producers Oil Co.	$ 216,000	S. W. & B. Oil Co.	$ 41,566
Producers & Consumers	97,000	Thirty-Three Oil Co.	670,000
Record Oil Co.	242,500	Thirty-Two Oil Co.	36,000
Regal Oil Co.	6,000	Traders Oil Co.	224,096
Reed Crude Oil	1,124,000	Turner Oil Co.	69,667
Revenue Oil Co.	128,000	Union Oil Co.	25,320,943
Rice Ranch Oil	135,000	United Oil Co.	201,254
Royalty Oil	8,000	United Petrol	2,885,000
Sacramento Oil	145,000	U. S. Oil & Mng. Co.	60,000
S. F. & McKittrick Oil	460,000	Vanderlip Oil	5,445
Sauer Dough Oil	514,061	Wabash Oil Co	114,000
Section Six Oil Co.	12,000	Ward Oil Co.	24,000
Section Twenty-Five	210,000	West Coast Oil Co.	124,896
Sesnon Oil Co.	171,000	Western Union Oil	494,950
Shawmut Oil Co.	35,000	West Shore Oil Co.	235,000
Silver Tip Oil Co.	42,000	White Star Oil	25,000
Sovereign Oil Co.	110,000	W. K. Oil Co	60,000
Springfield Oil	50,000	Wrenn Oil Co.	41,000
State Cons. Oil Co.	4,093	Yellowstone Oil	8,000
Sterling Oil & Development Co.	778,250	Zier Oil	10,000
Superior Oil Co.	67,500		
			$67,550,403

The following companies are paying dividends but we were unable to arrive at any definite amount:

Commercial Petroleum.....$1.00 per share per month
Eastern Consolidated.....¼ to ½ per cent per month; has paid nine
California Coast Oil.....Rate not given; has paid thirty-nine
Coalinga Enterprise.....Rate not given; paid one
Coalinga Oil.....Rate not given; paid 112
Federated Oil.....Rate not given
Henrietta Oil.....Rate from one to two cents per share; paid three
Murphy Oil Co.....I am informed this is a very heavy dividend payer
Ojai Valley Petrol.....Rate 1 per cent per month; paid eight

I think it would not be an exaggeration to say that these companies have paid at least $10,000,000 in dividends, which amount should be added to the above figures.

L. F. PARSONS,

Publisher of the Oil Bradstreet,
Manager L. A. Stock Exchange.

PALMER UNION OIL COMPANY

Asphalt Industry in California

IN THE manufacture of asphalt from crude oil, California has a new industry; an industry that must inevitably and soon become a leading one of the Pacific Coast. Within the United States there are more than 1,000,000 miles of highways over which the mails are carried, and along the greater part of these the residents demand improvement. "Good Roads" is the slogan of farmer and villager and city dweller alike.

California asphalt is the material that makes good roads; it is the best binder in the world for the various forms of modern road construction. It is the material which is to pave the roads of this country, and of the entire world. Although a comparatively new product, there is already a demand for it from European countries, and even from Australia and New Zealand, and this demand is increasing by leaps and bounds.

Ten years ago the manufacture of asphalt in this State was in its infancy. To be exact, the output in 1901 was only 27,000 tons. This past year it was 151,000 tons, and of a quality that insures its becoming the material which is to pave the roads of the world. Yes, and also the roofs of the world. In the great cities of the Eastern States, where there

is the greatest demand for this material, California asphalt has had an uphill fight for recognition on account of high freight rates, but has finally won out on its merits. In the beginning, the purer quality of California asphalt was not fully appreciated, but contractors gradually learned its value by mixing it with imported natural asphalts, mostly from Trinidad, which greatly increased the toughness and wearing quality of the natural product.

Down on the Island of Trinidad there is a large lake of natural asphalt, which is easily and cheaply mined and transported to the ports of the world. The main point made for it by those interested in its use is that what Nature has been centuries in making is better than any man-made material. This, however, is a false contention, at least so far as it applies to asphalt. The Trinidad asphalt contains quantities of sticks, leaves and roots, carried by wind and water, and other organic matter which originated in the condensation down in Nature's refinery of some of the denser bitumen itself into a substance which is no longer bitumen. The result is that Trinidad asphalt is only fifty-six per cent pure, while that of California is ninety-nine and nine-tenths per cent. Mark the difference.

The main requirements for a good asphalt are uniformity of character and stability in consistency at the extremes of temperature which it meets when

used for pavement and roofing. Some years ago an authority on asphalt, but prejudiced in favor of the Trinidad product, justly said of the California asphalts: "They are all more or less carelessly manufactured, without laboratory control, and consequently vary in character and consistency."

The California refiners read that criticism with much profit to themselves; every refinery in the State today has its laboratory and chemist, with the result that the entire output is uniform in quality and the best asphalt in the world. For the past five years the users of Trinidad asphalt have been fluxing it with larger and larger percentages of the California product, in order to give it the necessary lasting qualities.

The manufacture of asphalt is a simple and lucrative business. The oil for the purpose is run into huge steel tanks, shaped like an engine boiler, and fires are started under them precisely as they are under a steam boiler. When the oil has reached a temperature of 300 degrees F. the first "cut" is made. That is, at this temperature, a 38 gravity oil called "stove distillate" rises from it, passes into a still and is condensed. At 600 degrees the second "cut" is made, which is 29 gravity fuel oil. The material now left in the tanks is pure asphalt. It is run into cooling tanks, and at 180 degrees is put into barrels for shipment.

Pacific Coast Railway Company's Daily Train of Oil Cars Loading at Palmer Union Camp

PALMER UNION OIL COMPANY

On an average, 13 barrels of oil make a ton of asphalt, besides a nearly equal amount of distillate and high gravity fuel oil. These two last products more than pay for the cost of manufacture, so the profit in the industry can be figured out roughly at 100 per cent on the original cost of the crude oil, which is about 50 cents a barrel. Asphalt sells in this market for about $13.00 per ton.

The arbitrary term of malthene has been given to that property of asphalt, which is its adhesiveness or binding power. Some oils have more malthene than others, and are consequently more valuable for the manufacture of asphalt. The oil of the San Joaquin fields, for instance, contains 60 per cent malthene, while the oil from Santa Maria-Palmer fields contains 84 per cent malthene. About one-half of Palmer oil separates into asphalt and the other one-half into distillate of about 33 gravity. This oil has proven so valuable for asphalt that the Pacific Coast Railway is extending its line from Sisquoc direct to the storage tanks of the Palmer gushers, in order to transport it direct to the refineries near Port Harford.

The modern asphalt street is the result of 30 years of experimentation. Until recently cement and other binders were used for the several lower layers of a street, the asphalt being used for binding the upper layer and, finally, for surfacing it. The cement binders have proven to be too inelastic, too brittle, and

the result found, after many years, is that the best streets are made with asphalt for a binder from the very base. This, of course, largely increases the quality of its use per yard of road.

Asphalt is the cheapest and most durable material known for surfacing a street, and a carpet of it can be repaired or wholly replaced at minimum cost. Next to it in cheapness and value is crude oil carpeting. The latter is being largely used for surfacing country roads. In the saving in time, and trucking and the hauling of heavy roads, an asphalt pavement soon returns its cost to the public. The expense of maintaining a two-horse truck in the city is $10.00 a day. On an asphalt pavement this same outfit can haul 33 per cent larger loads than on unpaved streets.

According to the best authorities—experts of the big refining companies and city and county engineers throughout the land—the outlook for increased demand for California asphalt could not be better. The manufacture and sale of it this year will exceed 250,000 tons. Next year the sales are expected to exceed 400,000 tons, and thereafter the demand for it will largely increase from year to year.

The world over there is an unanimous call for good roads, and California asphalt will be largely used as a binder for all that are built. Considerable of the material is now going to Canada, Australia, Germany and other European countries for this purpose.

In the United States a national highway is to be built from New York to Los Angeles, and from that point to Seattle and Galveston, which will require an immense amount of the material. In the immediate future Pennsylvania is to expend $50,000,000, New York $15,000,000, and California $18,000,000 for good roads, and many other States are about to make like appropriations for the same purpose. Throughout the country hundreds of towns already have one or more asphalt streets and will lay others as their finances permit. All this work calls for more and more asphalt of California manufacture. For roofing, also, the material has not its equal as a mixture with sand and gravel, or as a coating for the various roofing felts and papers. The demand for it for this purpose is also steadily growing.

Finally, it has been fully demonstrated that the California asphalt industry, now in its infancy, is soon to become one of the State's greatest industries—an industry that will rank well with that of orange growing or mining.

About 1882, when Henry Villard was planning the extension of his Northern Pacific Railroad to this Coast, he built as a feeder for it the Pacific Coast Railway, from Port Harford to San Luis Obispo, then into the Santa Maria Valley, for the purpose of shipping the wheat and barley grown there to the mills of St. Paul. His Northern Pacific road never

Palmer Union Oil Company's Steel Storage Tanks

materialized in California, but the little coast line paid from the start in transporting grain to Port San Luis, where it was shipped to Portland by water.

In due time the grain fields of Santa Maria became fields of sugar beets, which furnished even greater tonnage to the railroad. And on top of that has come the oil industry in the Santa Maria-Palmer fields, which is giving the road even more to do. In fact, this has become its greatest source of revenue.

It has been found that the oil from the Palmer gushers is especially valuable for making asphalt, as well as for use for fuel, and in order to handle the immense quantities of it that the Edna Port Harford refineries are calling for, the railroad is now extending its line from Sisquoc direct to the storage tanks on the Palmer properties. The extension will be completed about November first.

(Signed) J. W. SCHULTZ.

The Future of Oil—California's Greatest Industry

A CAREFUL reading of the foregoing pages of this book must convince everyone of the vastness of the oil industry in California and that it is on as sound and permanent a basis as the coal industry of Pennsylvania; that our California oil is liquid coal, and that all that is necessary is to conduct the oil business on a sound business-like basis and wait for the larger consumption, broader markets and higher prices that will inevitably prevail in the coming years as a result of the completion of the Panama Canal and the vast change in the world's commerce resulting therefrom, making the Pacific Coast petroleum industry one of the world's greatest industries.

Just as all of the Pacific Coast transportation companies and manufacturing plants, and practically all of the steamships now plying on the Pacific Ocean, use oil as fuel, so, with the completion of the Panama Canal, a vast number of added ships plying between the European and Atlantic Coasts and the Pacific Coast and Oriental ports will be compelled to use our California oil as fuel because of its lower cost than coal and greater efficiency and economy in operating. So, also, will the many new industries that will spring

up here on the Western Coast, as a result of the great increase in the population of our Pacific Coast and Western States resulting from the completion of the Panama Canal, furnish added home markets for our petroleum.

Further, the good roads movement that is now spreading rapidly over the United States is certain to greatly increase the demand for asphalt, which has proven the best road building material; and as our California oil (particularly our Palmer Union Oil) has been proven to be the best adapted for the manufacture of asphalt, this insures a still further large and expanding market for California oil.

So, also, the great refining plants that now exist and are being built on the Pacific Coast for the manufacture of gasoline, kerosene, lubricating oils and many other by-products of petroleum, will furnish an extensive and steadily increasing market in the countries of the Pacific that will be brought into closer business relations with us through the completion of the Panama Canal.

All these mighty forces presage a steady and constant increase and development in California's Greatest Industry, and an ever-expanding market for its products. This means, also, steadily advancing prices and more remunerative returns to the producers, and greater permanency of the industry than ever before in its history.

This, in our judgment, is the message conveyed by the eminent writers of the able reports in the preceding pages of this book, which we respectfully submit for your careful consideration and thoughtful study, believing that it must carry conviction as to the permanency and increasing profit of the petroleum industry of California.

PALMER UNION OIL COMPANY,
FRANK L. BROWN, President.

PALMER UNION OIL COMPANY

Officers of Palmer Union Oil Company

FRANK L. BROWN . . . . . President
J. C. KEMP VAN EE . . . . 1st Vice-President
LEWIS A. HILBORN . . . . 2d Vice-President
GEO. L. WALKER . . . . . Treasurer
C. JEPSEN . . . . . Secretary
W. W. ORCUTT . . . . . Consulting Engineer

DIRECTORS

FRANK L. BROWN . . . . . President
J. C. KEMP VAN EE . . . . 1st Vice-President
LEWIS A. HILBORN . . . . 2d Vice-President
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